THEREFORE WHAT IS CLAIMED IS:

1. An x-ray detector, comprising:

at least one detector element including an electrically conductive plate substrate with a first planar surface and an upper edge and a lower edge, at least two electrically conductive elongate strip electrodes spaced from each other, each electrically conductive elongate strip electrode being mounted on an insulator interposed between the electrically conductive elongate strip electrode and the first planar surface of the electrically conductive plate substrate;

the electrically conductive plate substrate being made of a high density metal and the at least one detector element being oriented with respect to a source of x-rays so that the electrically conductive plate substrate is aligned in a direction of a flux of incident x-rays in order for x-rays entering the upper edge of the electrically conductive plate substrate to travel through a length of the electrically conductive plate substrate thereby increasing the probability of absorption of the x-rays by the electrically conductive plate substrate;

a power supply for applying a bias voltage between each electrically conductive plate substrate and the electrically conductive strip electrodes; and

a detector for detecting an electrical current generated by displacement of electrical charges produced in an ionization medium located in spaces between the electrically conductive plate substrate and the electrically conductive elongate strip electrodes, which in turn are produced by high energy electrons which are generated by x-rays absorbed in the electrically conductive plate substrate.

2. The x-ray detector according to claim 1 wherein the electrically conductive strip elongate electrodes are mounted on the first planar surface of the electrically conductive plate substrate in pre-selected alignment with each other and the electrically conductive plate substrate so that they are aligned generally in the direction of the flux of incident x-rays so that the detected electrical current is indicative of a spatial position of the x-rays in the flux which produce the electrical charges giving rise to the detected electrical current.

3. The x-ray detector according to claim 2 wherein the at least one detector element is two or more detector elements aligned together in a stack, each detector element being positioned in the stack in such a way such that each detector element is aligned in the direction of the flux of x-rays incident on each detector element when the x-ray detector is in use.

4. The x-ray detector according to claim 3 including spacers mounted on the first planar surface of each electrically conductive plate substrate for preventing the electrically conductive elongate strip electrodes on one

electrically conductive plate substrate from electrically contacting an electrically conductive plate substrate in an adjacent detector element.

5. The x-ray detector according to claim 4 wherein the spacers are conductive elongate strip spacers, one located between each electrically conductive elongate strip electrode and aligned in the direction of the flux of x-rays incident on that given detector element and affixed to the electrically conductive plate substrate, and wherein the conductive elongate strip spacers are made of a high density metal whereby x-rays absorbed in the conductive elongate strip spacers generate high energy electrons which produce electrical charges in the ionization medium and block high energy electrons exiting the electrically conductive plate substrate in a direction substantially transverse to the direction of the flux of incident x-rays in order to improve the spatial resolution of the x-ray detector in the transverse direction.

6. The x-ray detector according to claim 4 wherein the two or more detector elements is between two and about 10,000 detector elements.

7. The x-ray detector according to claim 4 wherein the ionization medium is contained within the stack between the electrically conductive plate substrates and the electrically conducting elongate strip electrodes on each electrically conductive plate substrate.

8. The x-ray detector according to claim 4 wherein the electrically conductive elongate strip electrodes are spaced from each other by a distance in a range from about 0.01 mm to about 10 mm.

9. The x-ray detector according to claim 4 wherein each electrically conductive plate substrate is tapered with the upper edge being narrower than the lower edge of the electrically conductive plate substrate so that the electrically conductive elongate strip electrodes on all the electrically conductive plate substrates are aligned with the incident flux of x-rays from the x-ray source.

10. The x-ray detector according to claim 4 wherein the detector for detecting the electrical current includes an active readout matrix electrically connected to each electrically conductive elongate strip electrode on each electrically conductive plate substrate.

11. The x-ray detector according to claim 10 wherein the electrical connection between the active readout matrix and the electrically conductive elongate strip electrodes is achieved by using an anisotropic conductive adhesive film or an anisotropic conductive elastomer film located between the active readout matrix and an exposed portion of each electrically conductive elongate strip electrode located at the lower edge of the electrically conductive plate substrate.

12. The x-ray detector according to claim 10 wherein the electrical connection between the active readout matrix and the electrically conductive elongate strip electrodes is achieved by using an anisotropic conductive adhesive film or an anisotropic conductive elastomer located between the active readout matrix and an exposed portion of each electrically conductive elongate strip electrode located at the upper edge of the electrically conductive plate substrate.

13. The x-ray detector according to claim 4 wherein the detector for detecting the electrical current includes a thin film transistor array located on each detector element so that each electrically conductive elongate strip electrode is connected by an individual thin film transistor to a data line when the thin film transistor is on, and wherein each electrically conductive elongate strip electrode is connected to its own data line.

14. The x-ray detector according to claim 4 including a thin film of an electrically conductive material formed directly on the surface of the electrically conductive plate substrate.

15. The x-ray detector according to claim 4 wherein the electrically conductive plate substrates each include a second planar surface parallel to the first planar surface, at least two electrically conductive elongate strip electrodes spaced from each other and each electrically conductive elongate

strip electrode being mounted on an insulator interposed between the electrically conductive elongate strip electrode and the second planar surface of the electrically conductive plate substrate.

16. The x-ray detector according to claim 15 including additional spacers mounted on the second planar surface of each electrically conductive plate substrate for preventing the electrically conductive elongate strip electrodes on one electrically conductive plate substrate from electrically contacting an electrically conductive plate substrate in an adjacent detector element.

17. The x-ray detector according to claim 16 wherein the additional spacers are conductive elongate strip spacers, one located between each elongate conductive strip electrode aligned in the direction of the flux of x-rays incident on that given detector element and affixed to the second planar surface of the electrically conductive plate substrate, and wherein the conductive elongate strip spacers are made of a high density metal whereby x-rays absorbed in the conductive elongate strip spacers generate high energy electrons which produce electrical charges in the ionization medium and block high energy electrons exiting the electrically conductive plate substrate in a direction substantially transverse to the direction of the flux of incident x-rays in order to improve the spatial resolution of the x-ray detector in the transverse direction.

18. The x-ray detector according to claim 4 wherein the electrically conductive elongate strip electrodes are sufficiently thin such that the electric field in the vicinity of the electrically conductive elongate strip electrodes is sufficiently high to cause gas multiplication or gas amplification in such a way that a charge signal collected by each electrically conductive elongate strip electrode is linearly amplified.

19. The x-ray detector according to claim 4 wherein each electrically conductive plate substrate has a length from the upper edge to the lower edge of about 3 mm to about 30 cm through which the x-rays penetrate, and a width of between about 3 cm to about 100 cm, and a thickness in a range from about 0.01 mm to about 10 mm.

20. The x-ray detector according to claim 4 wherein the ionization medium is a gas, and wherein the at least one detector element is sealed in a leak tight housing.

21. The x-ray detector according to claim 4 wherein the ionization medium is air.

22. The x-ray detector according to claim 4 wherein the ionization medium is an ionizable liquid, and wherein the at least one detector element is sealed in a leak tight housing.

23. The x-ray detector according to claims 4 wherein the ionization medium is an ionizable solid.

24. The x-ray detector according to claim 4 wherein the stack is produced by the steps of:

machining a pre-selected number of substantially identical tapered electrically conductive plate substrates with the size of each substrate larger than that required by the detector;

fabricating on the first planar surface of each tapered electrically conductive plate substrate a substantially identical microstructure comprising

the at least two electrically conductive elongate strip electrodes,

the insulator interposed between each electrically conductive elongate strip electrodes and the first planar surface, and

the spacers;

packing and bonding together the tapered electrically conductive plate substrates to form a fan-shaped pre-stack structure, and

machining the fan-shaped pre-stack structure to produce the stack having a flat top surface and a flat bottom surface, wherein the top surface of the stack faces the x-ray source when assembled with the x-ray source.

25. The x-ray detector according to claim 24 wherein the substantially identical microstructures on each electrically conductive plate substrate are produced using photolithographic processing.

26. The x-ray detector according to claim 24 wherein the substantially identical microstructures on each electrically conductive plate substrate are produced using electroplating.

27. The x-ray detector according to claim 4 wherein the stack is produced by the steps of:

machining a pre-selected number of substantially identical tapered electrically conductive plate substrates with the size of each substrate larger than that required by the detector;

packing together the tapered electrically conductive plate substrates to form a fan-shaped pre-stack structure, and

machining the fan-shaped pre-stack structure to produce the stack having a flat top surface and a flat bottom surface, wherein the top surface of the stack faces the x-ray source when assembled with the x-ray source;

disassembling the stack and applying a different portion of an oversized mask with a pre-selected pattern to the first surface of each tapered electrically conductive plate substrate and with the mask in place and fabricating on the first planar surface of each tapered electrically conductive plate substrate a substantially identical microstructure comprising the at least two electrically conductive elongate strip electrodes,

the insulator interposed between each electrically conductive elongate strip electrodes and the first planar surface, and

the spacers;

repacking the tapered electrically conductive plate substrates in their pre-selected locations in the stack and bonding them together, whereby the step of applying the different portion of the oversized mask with a pre-selected pattern to the first surface of the different tapered electrically conductive plate substrates ensures the conductive elongate strip spacers and the at least two electrically conductive elongate strip electrodes on each of the tapered electrically conductive plate substrates are aligned in the direction of the flux of x-rays incident on that given detector element.

28. The x-ray detector according to claim 27 wherein the substantially identical microstructures on each electrically conductive plate substrate are produced using photolithographic processing.

29. The x-ray detector according to claim 27 wherein the substantially identical microstructures on each electrically conductive plate substrate are produced using electroplating.